

## AMENDMENTS TO THE CLAIMS:

1. (currently amended): An interleaving method interleaving input data received in a time series comprising the steps of:

storing the input data in a storing unit;

~~arranging data to be transmitted in a matrix~~

outputting said stored data, the output data in an order different from an order of the input data; and

controlling by a control unit the storing and outputting steps causing the output data order to be representative of arranging the input data in a matrix, ~~rearranging said data by~~ interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and ~~by~~ interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data,[[; ]] and causing the outputting of said rearranged data in time series.

2. (currently amended): A de-interleaving method de-interleaving interleaved data received in a time series comprising the steps of:

storing said interleaved data in a storing unit;

~~arranging received data having been interleaved in a matrix~~

outputting said stored data, the output data in an order the same as before the data was interleaved; and

controlling by a control unit the storing and outputting steps causing the output data order to be representative of arranging the interleaved data in a matrix, ~~rearranging said outputted data by~~ interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and ~~by~~ interchanging

columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data, ~~and causing the outputting of said rearranged data in time series, thereby outputting said received data in the order before said received data was interleaved.~~

**3. (currently amended):** An interleaving apparatus for interleaving data to be transmitted, comprising:

a storing unit for storing data to be transmitted; and

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a control unit for controlling said storing unit so that said data to be transmitted is ~~outputted~~ output from said storing unit ~~with said data to be transmitted arranged in a matrix and said data to be transmitted in a rearranged order, the rearranged order representative of arranging the data to be transmitted in a matrix, by~~ interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and ~~by~~ interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data.

**4. (currently amended):** The interleaving apparatus according to claim 3, wherein said control unit ~~comprises~~ including a write control unit for generating a write address to be used to write said data to be transmitted ~~in~~ into said storing unit, said write control unit generating a sequence of write addresses causing the data to be transmitted to be stored in said storing unit representative of having ~~with~~ said data to be transmitted arranged in a matrix ~~and~~ rearranged by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and by interchanging columns of the matrix according to a predetermined order, each column

representing a set of data pieces of said data, and for writing said data to be transmitted in said storing unit, and said control unit reads said data to be transmitted stored in said storing unit in the order of addresses.

5. **(currently amended)**: The interleaving apparatus according to claim 4, wherein said write control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~ generating row numbers, and said write control unit writes said data to be transmitted in said storing unit with numbers generated by said column number generating unit and said row number generating unit as said write address to write said data to be transmitted in said storing unit.

6. **(original)**: The interleaving apparatus according to claim 5, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.

7. **(currently amended)**: The interleaving apparatus according to claim 3, wherein said control unit writes said data to be transmitted in said storing unit in the order of addresses, and said control unit ~~comprises~~ including a read control unit for generating a read address to be used to read said data to be transmitted from said storing unit, said read control unit generating a sequence of read addresses causing the data to be transmitted to be read from said storing unit in an order representative of having with said data to be transmitted ~~stored in said storing unit~~ arranged in a matrix and rearranged by interchanging rows of the matrix according to a predetermined order, each row

representing a set of data pieces of said data, and by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data to read said data to be transmitted.

**8. (currently amended):** The interleaving apparatus according to claim 7, wherein said read control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~ generating row numbers, and said read control unit reads said data to be transmitted from said storing unit with numbers generated by said column number generating unit and said row number generating unit as said read address.

**9. (original):** The interleaving apparatus according to claim 8, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.

**10. (currently amended):** A de-interleaving apparatus for de-interleaving received data, comprising:

a storing unit for storing said received data; and

a control unit for controlling said storing unit so that said received data is ~~outputted~~ output from said storing unit in a state before said received data was interleaved, the controlling said storing unit representative of ~~by~~ arranging said received data in a matrix and rearranging said received data by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said

data, and by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data.

11. **(currently amended):** The de-interleaving apparatus according to claim 10, wherein said control unit ~~comprises~~ including a write control unit for generating a write address to be used to write said received data ~~in~~ into said storing unit in a state before said received data was interleaved, said write control unit generating a sequence of write addresses causing said received data to be stored in said storing unit representative of by arranging said received data in a matrix and rearranging said received data by interchanging rows of the matrix according to a predetermined order, ~~each row representing a set of data pieces of said data,~~ and by interchanging columns of the matrix according to a predetermined order, ~~each column representing a set of data pieces of said data,~~ to write said received data, and said control unit reads said received data stored in said storing unit in the order of addresses.

12. **(currently amended):** The de-interleaving apparatus according to claim 11, wherein said write control unit ~~comprises~~ including a column number generating unit ~~for~~ randomly generating column numbers and a row number generating unit ~~for randomly~~ generating row numbers, and said write control unit writes said data in said storing unit with numbers generated by said column number generating unit and said row number generating unit as a write address.

13. **(original):** The de-interleaving apparatus according to claim 12, wherein each of said column number generating unit and said row number generating unit is

configured with a memory for holding numbers used as addresses in a predetermined order.

14. **(currently amended):** The de-interleaving apparatus according to claim 10, wherein said control unit writes said received data in said storing unit in the order of addresses, and said control unit has a read control unit for generating a read address to be used to read said received data in a state before said received data was interleaved from said storing unit, said read control unit generating a sequence of read addresses causing the stored data to be read from said storing unit in an order representative of by arranging said received data ~~stored in said storing unit~~ in a matrix and rearranging said received data by interchanging rows of the matrix according to a predetermined order, ~~each row representing a set of data pieces of said data,~~ and by interchanging columns of the matrix according to a predetermined order, ~~each column representing a set of data pieces of said data,~~ and for reading said received data from said storing unit.

15. **(currently amended):** The de-interleaving apparatus according to claim 14, wherein said read control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~ generating row numbers, and said read control unit reads said received data from said storing unit with numbers generated by said column number generating unit and said row number generating unit as a read address.

16. (original): The de-interleaving apparatus according to claim 15, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.

17. (currently amended): An interleaving/de-interleaving system comprising an interleaving apparatus for interleaving data to be transmitted and a de-interleaving apparatus for receiving said transmitted data interleaved by said interleaving apparatus to de-interleave said transmitted data,

wherein said interleaving apparatus, comprising:

a storing unit for storing data to be transmitted; and

a control unit for controlling said storing unit so that said data to be transmitted is output from said storing unit in an order representative of having-outputs  
~~said data to be transmitted with said data to be transmitted~~ said data to be transmitted arranged said data to be transmitted in a matrix and rearranged by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data,

and said de-interleaving apparatus, comprising:

a storing unit for storing said received data; and

a control unit for controlling said storing unit, thereby outputting said  
~~outputs~~ received data from said storing unit in a state before said transmitted data was interleaved, said control unit generating a sequence of write addresses causing said  
received data to be stored in said storing unit representative of ~~by~~ arranging said received  
data in a matrix and rearranging said received data by interchanging rows of the matrix

according to a predetermined order, each row representing a set of data pieces of said data, and by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data.

**18. (cancelled)**

**19. (currently amended):** An interleaving apparatus for interleaving data to be transmitted, comprising:

a storing unit for storing data to be transmitted;

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a control unit for controlling said storing unit so that said data to be transmitted is ~~outputted~~ output from said storing unit in an order representative of having with said data to be transmitted arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data; and

wherein said control unit ~~comprises~~ including a write control unit for generating a write address to be used to write said data to be transmitted ~~in~~ into said storing unit, said write control unit generating a sequence of write addresses causing the data to be transmitted to be stored in said storing unit representative of having with said data to be transmitted arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to a predetermined order, ~~each row representing a set of data pieces of said data,~~ and interchanging columns of the matrix according to a predetermined order, ~~each column representing a set of data pieces of said~~



data, and for writing said data to be transmitted ~~in~~ into said storing unit, and said control unit reads said data to be transmitted stored in said storing unit ~~according to the order of~~ addresses of said storing unit.

**20. (currently amended):** An interleaving apparatus for interleaving data to be transmitted, comprising:

a storing unit for storing data to be transmitted;

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a control unit for controlling said storing unit so that said data to be transmitted is ~~outputted~~ output from said storing unit in an order representative of having ~~with~~ said data to be transmitted arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and interchanging columns of the matrix according to ~~[[a]]~~ another predetermined order, each column representing a set of data pieces of said data; and

wherein said control unit ~~comprises~~ including a write control unit for generating a write address to be used to write said data to be transmitted ~~in~~ into said storing unit, said write control unit generating a sequence of write addresses causing the data to be transmitted to be stored in said storing unit representative of having ~~with~~ said data to be transmitted arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to ~~[[a]]~~ the predetermined order, ~~each row representing a set of data pieces of said data,~~ and interchanging columns of the matrix according to ~~[[a]]~~ the other predetermined order, ~~each column representing a set of data pieces of said data,~~ and for writing said data to be transmitted ~~in~~ into said storing unit so

as to be read said data from said storing unit according to the order of addresses of said storing unit.

**21. (currently amended):** The interleaving apparatus according to claim 19, wherein said ~~read~~ control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~ generating row numbers, and said write control unit writes said data to be transmitted in said storing unit with numbers generated by said column number generating unit and said row number generating unit as said write address to write said data to be transmitted in said storing unit.

**22. (currently amended):** The interleaving apparatus according to claim 20, wherein said ~~write~~ control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~ generating row numbers, and said write control unit writes said data to be transmitted in said storing unit with numbers generated by said column number generating unit and said row number generating unit as said write address to write said data to be transmitted in said storing unit.

**23. (currently amended):** An interleaving apparatus for interleaving data to be transmitted, comprising:

a storing unit for storing data to be transmitted;

a control unit for controlling said storing unit so that said data to be transmitted is ~~outputted~~ output from said storing unit in an order representative of having

with said data to be transmitted arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and interchanging columns of the matrix according to ~~[[a]]~~ another predetermined order, each column representing a set of data pieces of said data; and

wherein said control unit writes said data to be transmitted in said storing unit according to the order of addresses of said storing unit, and said control unit ~~comprises~~ including a read control unit for generating a read address to be used to read said data to be transmitted from said storing unit, said read control unit generating a sequence of read addresses causing the data to be transmitted to be read from said storing unit in an order representative of having ~~with~~ said data to be transmitted ~~stored in said storing unit~~ arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to ~~[[a]]~~ the predetermined order, ~~each row representing a set of data pieces of said data,~~ and interchanging columns of the matrix according to ~~[[a]]~~ the other predetermined order, ~~each column representing a set of data pieces of said data, to read said data to be transmitted.~~

**24. (currently amended):** An interleaving apparatus for interleaving data to be transmitted, comprising:

a storing unit for storing data to be transmitted;

a control unit for controlling said storing unit so that said data to be transmitted is ~~outputted~~ output from said storing unit in an order representative of having ~~with~~ said data to be transmitted arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to a row predetermined order, each row

representing a set of data pieces of said data, and interchanging columns of the matrix according to a column predetermined order, each column representing a set of data pieces of said data; and

wherein said control unit ~~comprises~~ including a read control unit for generating a read address to be used to read said data to be transmitted, ~~written~~ said data to be transmitted stored in the order of addresses of said storing unit, from said storing unit, said read control unit generating a sequence of read addresses causing the data to be transmitted to be read from said storing unit in an order representative of having ~~with~~ said data to be transmitted ~~stored in said storing unit~~ arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to ~~[[a]]~~ the row predetermined order, ~~each row representing a set of data pieces of said data,~~ and interchanging columns of the matrix according to ~~[[a]]~~ the column predetermined order, ~~each column representing a set of data pieces of said data, to read said data to be transmitted.~~

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**25. (currently amended):** The interleaving apparatus according to claim 23, wherein said read control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~ generating row numbers, and said read control unit reads said data to be transmitted from said storing unit with numbers generated by said column number generating unit and said row number generating unit as said read address.

**26. (currently amended):** The interleaving apparatus according to claim 24, wherein said read control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~

generating row numbers, and said read control unit reads said data to be transmitted from said storing unit with numbers generated by said column number generating unit and said row number generating unit as said read address.

**27. (previously added):** The interleaving apparatus according to claim 21, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.


**28. (previously added):** The interleaving apparatus according to claim 22, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.

**29. (previously added):** The interleaving apparatus according to claim 25, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.

**30. (previously added):** The interleaving apparatus according to claim 26, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.

**31. (previously amended):** A de-interleaving apparatus for de-interleaving received data, comprising:

- a storing unit for storing said received data;
- a control unit for controlling said storing unit so that said received data is ~~outputted~~ output from said storing unit in a state before said received data was interleaved, the controlling of said storing unit representative of by arranging said received data in a matrix and rearranging said received data by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and by interchanging columns of the matrix according to ~~[[a]]~~ another predetermined order, each column representing a set of data pieces of said data; and

 wherein said control unit ~~comprises~~ including a write control unit for generating a write address to be used to write said received data ~~in~~ into said storing unit in a state before said received data was interleaved, said write control unit generating a sequence of write addresses causing said received data to be stored in said storing unit representative of by arranging said received data in a matrix and rearranging said received data by interchanging rows of the matrix according to ~~[[a]]~~ the predetermined order, ~~each row representing a set of data pieces of said data,~~ and by interchanging columns of the matrix according to ~~[[a]]~~ the other predetermined order, ~~each column representing a set of data pieces of said data,~~ and to write said received data, ~~and said control unit reads said received data stored in said storing unit according to the order of addresses of said storing unit.~~

**32. (currently amended):** A de-interleaving apparatus for de-interleaving received data, comprising:

a storing unit for storing said received data;

a control unit for controlling said storing unit so that said received data is ~~outputted~~ output from said storing unit in a state before said received data was interleaved, the controlling of said storing unit representative of ~~by~~ arranging said received data in a matrix and rearranging said received data by at least one of interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and interchanging columns of the matrix according to ~~[[a]]~~ another predetermined order, each column representing a set of data pieces of said data; and

wherein said control unit ~~comprises~~ including a write control unit for generating a write address to be used to write said received data ~~to be transmitted in~~ into said storing unit, said write control unit generating a sequence of write addresses causing said received data to be stored in said storing unit representative of arranging ~~with~~ said received data ~~to be transmitted~~ arranged in a matrix and ~~rearranged by~~ at least one of interchanging rows of the matrix according to ~~[[a]]~~ the predetermined order, ~~each row representing a set of data pieces of said data,~~ and ~~by~~ interchanging columns of the matrix according to ~~[[a]]~~ the other predetermined order, ~~each column representing a set of data pieces of said data,~~ and for writing said received data ~~to be transmitted~~ in said storing unit so as to ~~[[be]]~~ read said received data from said storing unit according to the order of addresses of said storing unit.

**33. (currently amended):** The interleaving apparatus according to claim 31, wherein said write control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~

generating row numbers, and said write control unit writes said data to be transmitted in said storing unit with numbers generated by said column number generating unit and said row number generating unit as said write address to write said data to be transmitted in said storing unit.

**34. (currently amended):** The interleaving apparatus according to claim 32, wherein said write control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~ generating row numbers, and said write control unit writes said data to be transmitted in said storing unit with numbers generated by said column number generating unit and said row number generating unit as said write address to write said data to be transmitted in said storing unit.

**35. (currently amended):** A de-interleaving apparatus for de-interleaving received data, comprising:

- a storing unit for storing said received data;
- a control unit for controlling said storing unit so that said received data is ~~outputted~~ output from said storing unit in a state before said received data was interleaved, the controlling of said storing unit representative of ~~by~~ arranging said received data in a matrix and rearranging said received data by at least one of interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data; and



wherein said control unit writes said data to be transmitted in said storing unit according to the order of addresses of said storing unit, and said control unit ~~comprises~~ including a read control unit for generating a read address to be used to read said received data ~~to be transmitted~~ from said storing unit, said read control unit generating a sequence of read addresses causing the received data to be read from said storing unit in an order representative of having with said received data to be transmitted ~~stored in said storing unit~~ arranged in a matrix and rearranged by interchanging rows of the matrix according to [[a]] the predetermined order, each row representing a set of data pieces of said data, and by interchanging columns of the matrix according to [[a]] the predetermined order, each column representing a set of data pieces of said data, to read said data to be transmitted.


36. (currently amended): A de-interleaving apparatus for de-interleaving received data, comprising:

a storing unit for storing said received data;

a control unit for controlling said storing unit so that said received data is ~~outputted~~ output from said storing unit in a state before said received data was interleaved, the controlling said storing unit representative of ~~by~~ arranging said received data in a matrix and rearranging said received data by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data; and

wherein said control unit ~~comprises~~ including a read control unit for generating a read address to be used to read said received data ~~to be transmitted~~, written

in ~~the order of addresses of~~ said storing unit, from said storing unit, said read control unit generating a sequence of read addresses causing the received data to be read from said storing unit in an order representative of having with said received data to be transmitted ~~stored in said storing unit~~ arranged in a matrix and rearranged by interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and by interchanging columns of the matrix according to a predetermined order, each column representing a set of data pieces of said data, to read said data to be transmitted.

 **37. (currently amended):** The de-interleaving apparatus according to claim 35, wherein said read control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~ generating row numbers, and said read control unit reads said received data from said storing unit with numbers generated by said column number generating unit and said row number generating unit as a read address.

**38. (currently amended):** The de-interleaving apparatus according to claim 36, wherein said read control unit ~~comprises~~ including a column number generating unit ~~for randomly~~ generating column numbers and a row number generating unit ~~for randomly~~ generating row numbers, and said read control unit reads said received data from said storing unit with numbers generated by said column number generating unit and said row number generating unit as a read address.

**39. (previously added):** The de-interleaving apparatus according to claim 33, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.

**40. (previously added):** The de-interleaving apparatus according to claim 34, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.

**41. (previously added):** The de-interleaving apparatus according to claim 37, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.

**42. (previously added):** The de-interleaving apparatus according to claim 38, wherein each of said column number generating unit and said row number generating unit is configured with a memory for holding numbers used as addresses in a predetermined order.

**43. (currently amended)** A transmitting apparatus with an interleaving function, comprising:

an error detection encoding unit for encoding an error detecting bit and for adding said error detecting bit to data to be transmitted;

an error correction encoding unit for adding an error correcting code, which is to be used for error correction, to said data to be transmitted, sent from said error detection encoding unit;

an interleaving unit which includes a storing unit for storing said data to be transmitted, from said error detection encoding unit, and a control unit for controlling said storing unit so that said data to be transmitted is ~~outputted~~ output from said storing unit in an order representative of having ~~with~~ said data to be transmitted arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and interchanging columns of the matrix according to ~~[[a]]~~ another predetermined order, each column representing a set of data pieces of said data;

a signal assembling unit assembles interleaved data from said interleaving unit to form a signal format suited for transmission; and

a spreading unit for converting the signal sent from said signal assembling unit into a spread signal using a predetermined spreading code.

**44. (currently amended):** The transmitting apparatus with a interleaving function according to claim 43, wherein said control unit ~~comprises~~ including a write control unit for generating a write address to be used to write said data to be transmitted ~~in~~ into said storing unit, said write control unit generating a sequence of write addresses causing the data to be transmitted to be stored in said storing unit representative of having ~~with~~ said data to be transmitted arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to ~~[[a]]~~ the predetermined order, ~~each row representing a set of data pieces of said data,~~ and interchanging columns of the matrix

according to ~~[[a]] the other~~ predetermined order, ~~each column representing a set of data pieces of said data~~, and for writing said data to be transmitted ~~in~~ into said storing unit, and said control unit reads said data to be transmitted stored in said storing unit according to the order of addresses of said storing unit.

**45. (currently amended):** The transmitting apparatus with a interleaving function according to claim 43, wherein said control unit writes said data to be transmitted ~~in~~ into said storing unit according to the order of addresses of said storing unit, and said control unit ~~comprises~~ including a read control unit for generating a read address to be used to read said data to be transmitted from said storing unit, said read control unit generating a sequence of read addresses causing the data to be transmitted to be read from said storing unit in an order representative of having ~~with~~ said data to be transmitted ~~stored in said storing unit~~ arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to ~~[[a]] the~~ predetermined order, ~~each row representing a set of data pieces of said data~~, and interchanging columns of the matrix according to ~~[[a]] the other~~ predetermined order, ~~each column representing a set of data pieces of said data~~, ~~to read said data to be transmitted.~~

**46. (currently amended):** A receiving apparatus with a de-interleaving function, comprising:

a de-spreading unit for separating a desired signal from a received signal using a de-spreading code;

a data extracting unit for extracting received data from the signal separated by the de-spreading unit;

· a de-interleaving unit which includes a storing unit for storing said received data from said de-spreading unit, and a control unit for controlling said storing unit so that said received data is ~~outputted~~ output from said storing unit in a state before said received data was interleaved, the controlling of said storing unit representative of ~~by~~ arranging said received data in a matrix and rearranging said received data by at least one of interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and interchanging columns of the matrix according to ~~[[a]]~~ another predetermined order, each column representing a set of data pieces of said data;

an error correction decoding unit for decoding said received data de-interleaved by said de-interleaving unit, and for correcting an error included in said received data using an error correcting code; and

an error detecting unit for detecting an error detecting bit added when said received data is transmitted on the basis of a bit structure of the error detecting bit previously set.

**47. (currently amended):** The receiving apparatus with a de-interleaving function according to claim 46, wherein said control unit ~~comprises~~ including a write control unit for generating a write address to be used to write said received data ~~in~~ into said storing unit in a state before said received data was interleaved, said write control unit generating a sequence of write addresses causing said received data to be stored in said storing unit representative of ~~by~~ arranging said received data in a matrix and rearranging said received data by at least one of interchanging rows of the matrix according to ~~[[a]]~~ the predetermined order, ~~each row representing a set of data pieces of~~

said data, and interchanging rows of the matrix according to ~~[[a]] the other~~ predetermined order, ~~each column representing a set of data pieces of said data,~~ to write said received data, and said control unit reads said received data stored in said storing unit according to the order of addresses of said storing unit.

**48. (currently amended):** The receiving apparatus with a de-interleaving function according to claim 46, wherein said control unit writes said data to be transmitted ~~in~~ into said storing unit according to the order of addresses of said storing unit, and said control unit ~~comprises~~ including a read control unit for generating a read address to be used to read said received data ~~to be transmitted~~ from said storing unit, said read control unit generating a sequence of read addresses causing the received data to be read from said storing unit in an order representative of having with said received data to be transmitted stored in said storing unit arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to ~~[[a]] the~~ predetermined order, ~~each row representing a set of data pieces of said data,~~ interchanging columns of the matrix according to ~~[[a]] the other~~ predetermined order, ~~each column representing a set of data pieces of said data, to read said data to be transmitted.~~

**49. (currently amended):** A transmitting and receiving apparatus with a interleaving and de-interleaving function, comprising:

an error detection encoding unit for encoding an error detecting bit and for adding said error detecting bit to data to be transmitted;

an error correction encoding unit for adding an error correcting code, which is to be used for error correction, to said data to be transmitted, sent from said error detection encoding unit;

an interleaving unit which includes a storing unit for storing said data to be transmitted, from said error detection encoding unit, and a first control unit for controlling said storing unit so that said data to be transmitted is ~~outputted~~ output from said storing unit in an order representative of having ~~with~~ said data to be transmitted arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to a predetermined order, each row representing a set of data pieces of said data, and interchanging columns of the matrix according to ~~[[a]]~~ another predetermined order, each column representing a set of data pieces of said data;

a signal assembling unit assembles interleaved data from said interleaving unit to form a signal format suited for transmission;

a spreading unit for converting the signal sent from said signal assembling unit into a spread signal using a predetermined spreading code;

a duplexer for transmitting the spread signal from said spreading unit to an antenna;

a de-spreading unit for separating a desired signal from a received signal via said antenna and duplexer using a de-spreading code;

a data extracting unit for extracting received data from the signal separated by the de-spreading unit;

a de-interleaving unit which includes a storing unit for storing said received data from said de-spreading unit, and a second control unit for controlling said storing unit so that said received data is ~~outputted~~ output from said storing unit in a state



before said received data was interleaved, the controlling of said storing unit representative of by arranging said received data in a matrix and rearranging said received data by at least one of interchanging rows of the matrix according to [[a]] the predetermined order, each row representing a set of data pieces of said data, and interchanging columns of the matrix according to [[a]] the other predetermined order, each column representing a set of data pieces of said data;

an error correction decoding unit for decoding said received data de-interleaved by said de-interleaving unit, and for correcting an error included in said received data using an error correcting code; and

an error detecting unit for detecting an error detecting bit added when said received data is transmitted on the basis of a bit structure of the error detecting bit previously set.

50. (currently amended): The transmitting and receiving apparatus according to claim 49, wherein said first control unit ~~comprises~~ including a write control unit for generating a write address to be used to write said data to be transmitted ~~in~~ into said storing unit, said write control unit generating a sequence of write addresses causing the data to be transmitted to be stored in said storing unit representative of having with said data to be transmitted arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to [[a]] the predetermined order, ~~each row representing a set of data pieces of said data,~~ and interchanging columns of the matrix according to [[a]] the other predetermined order, ~~each column representing a set of data pieces of said data,~~ and for writing said data to be transmitted ~~in~~ into said storing unit,

and said first control unit reads said data to be transmitted stored in said storing unit according to the order of addresses of said storing unit.

FI  
51. (currently amended): The transmitting and receiving apparatus according to claim 49, wherein said first control unit writes said data to be transmitted in said storing unit according to the order of addresses of said storing unit, and said first control unit ~~comprises~~ including a read control unit for generating a read address to be used to read said data to be transmitted from said storing unit, said read control unit generating a sequence of read addresses causing the data to be transmitted to be read from said storing unit in an order representative of having ~~with~~ said data to be transmitted ~~stored in said storing unit~~ arranged in a matrix and rearranged by at least one of interchanging rows of the matrix according to ~~[[a]] the predetermined order, each row representing a set of data pieces of said data,~~ and interchanging columns of the matrix according to ~~[[a]] the other predetermined order, each column representing a set of data pieces of said data,~~ to read said data to be transmitted.

52. (currently amended): The transmitting and receiving apparatus according to claim 49, wherein said second control unit ~~comprises~~ including a write control unit for generating a write address to be used to write said received data ~~in~~ into said storing unit in a state before said received data was interleaved, said write control unit generating a sequence of write addresses causing said received data to be stored in said storing unit representative of by arranging said received data in a matrix and rearranging said received data by at least one of interchanging rows of the matrix according to ~~[[a]] the predetermined order, each row representing a set of data pieces of said data,~~ and

interchanging columns of the matrix according to  $[[a]]$  the other predetermined order;  
~~each column representing a set of data pieces of said data, to write said received data, and~~  
said second control unit reads said received data stored in said storing unit according to  
the order of addresses of said storing unit.

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**53. (currently amended):** The transmitting and receiving apparatus according to  
claim 49, wherein said second control unit writes said data to be transmitted ~~in~~ into said  
storing unit according to the order of addresses of said storing unit, and said control unit  
~~comprises~~ including a read control unit for generating a read address to be used to read  
said data to be transmitted from said storing unit with said data to be transmitted stored in  
said storing unit arranged in a matrix and rearranged by at least one of interchanging  
rows of the matrix according to a predetermined order, each row representing a set of  
data pieces of said data, and interchanging columns of the matrix according to a  
predetermined order, each column representing a set of data pieces of said data, to read  
said data to be transmitted.

**54.(new):** An interleaving apparatus for interleaving input data, comprising:  
a storing unit storing the data;  
a control unit for writing the data in said storing unit according to an order  
of addresses of the storing unit and the data is stored in a matrix which includes N pieces  
in a row and M pieces in a column, and the control unit for reading out the stored data  
from the storing unit in an order determined by interchanging an order of the M pieces of  
the column according to a predetermined rule and reading out according to a column by  
column order.

**55.(new):** The interleaving apparatus of claim 54, wherein the order of addresses for storing said data corresponds to storing the data row by row in said matrix and the order for reading out said data is further determined by interchanging an order of the N pieces in a row according to another predetermined rule.

**56.(new):** An interleaving apparatus for interleaving input data received in a time series, comprising:

a storing unit storing the data as a matrix;

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a control unit for writing the data in said storing unit in a row by row order and reading out the data in an order determined by at least one of interchanging columns according to a predetermined rule and interchanging rows according to another predetermined rule, and reading out the data column by column.

**57.(new):** An interleaving apparatus for interleaving input data received in a time series, comprising:

a storing unit storing the data as a matrix;

a control unit for writing the data in said storing unit in a column by column order and reading out the data in an order determined by at least one of interchanging rows according to a predetermined rule and interchanging columns according to another predetermined rule, and reading out the data row by row.

**58.(new):** An interleaving apparatus for interleaving input data received in a time series, comprising:

a storing unit storing the input data;

a control unit for writing the data into said storing unit and reading the data from said storing unit, and controlling the writing and reading of the data by arranging said storing unit addresses as a matrix, and writing the data to said storing unit in one of a row by row and column by column address order, and reading out the data in an address order determined by interchanging at least one of columns and rows of said matrix according to a predetermined rule and in one of a column by column and a row by row address order of the interchanged at least one of columns and rows of said matrix.

**59.(new):** An interleaving apparatus for interleaving input data to be transmitted, comprising:

a storing unit for storing input data to be transmitted;

a control unit for controlling said storing unit so that said data to be transmitted is output from said storing unit in a predetermined order different from an order of the input data,

wherein the predetermined order is determined by arranging addresses of said storing unit in a matrix and rearranging at least one of an order of the matrix columns according to another predetermined rule, each column representing a set of data pieces of said data and an order of the matrix rows according to a predetermined rule, each row representing a set of data pieces of said data;

wherein said control unit includes a write control unit for generating a write address to be used to write said data to be transmitted into said storing unit, said write address generated according to said matrix rearranged by at least one of interchanging rows of the matrix according to the predetermined rule and interchanging columns of the

matrix according to the other predetermined rule, and for writing said data to be transmitted into said storing unit, and

wherein said control unit includes a read control unit for generating a read address to be used to read said data to be transmitted from said storing unit.

**60.(new):** The interleaving apparatus of claim 59, wherein said read control unit generating a read addresses according to one of a row by row and column by column addresses of said matrix.

**61.(new):** An interleaving apparatus for interleaving input data to be transmitted, comprising:

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a storing unit for storing input data to be transmitted;

a control unit for controlling said storing unit so that said data to be transmitted is outputted from said storing unit in a predetermined order different from an order of the input data,

wherein the predetermined order is determined by arranging addresses of said storing unit in a matrix and rearranging at least one of an order of the matrix columns according to a predetermined rule, each column representing a set of data pieces of said data and an order of the matrix rows according to a predetermined rule, each row representing a set of data pieces of said data;

wherein said control unit includes a write control unit for generating a write address to be used to write said data to be transmitted in said storing unit,

wherein said control unit includes a read control unit for generating a read address to be used to read said data to be transmitted from said storing unit, said read

address generated according to said matrix rearranged by at least one of interchanging rows of the matrix according to the predetermined rule, and interchanging columns of the matrix according to the predetermined rule, and for reading said data to be transmitted from said storing unit.

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**62.(new):** The interleaving apparatus of claim 61, wherein said write control unit generating write addresses according to one of a row by row and column by column addresses of said matrix.

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